audio visual

No. 126 June 1982

Cover: ENG cameraman's way to work in future? A theme from the NAB Convention in Dallas visualised using Quantel's electronic paintbox...

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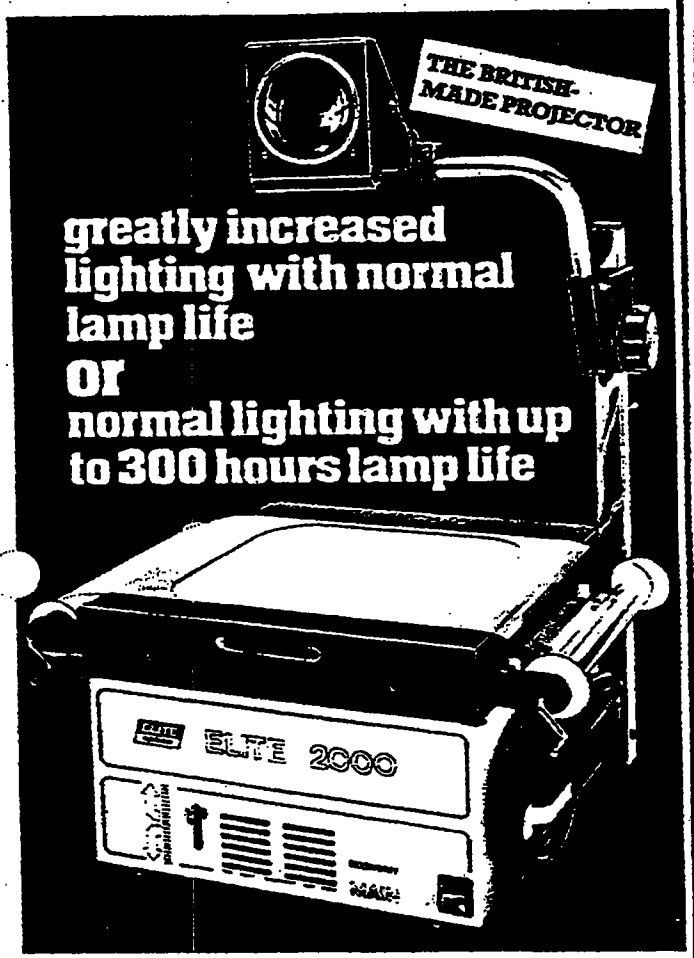

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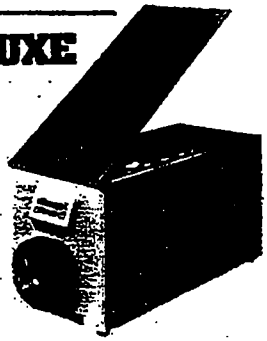

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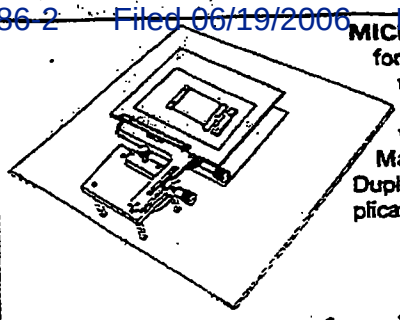

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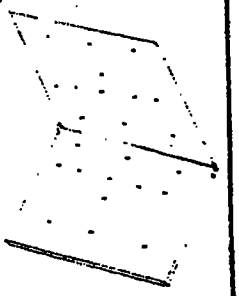

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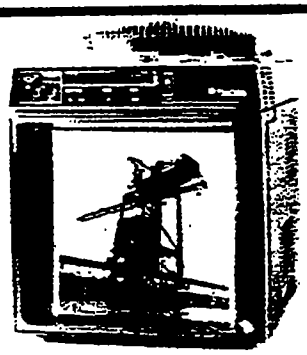

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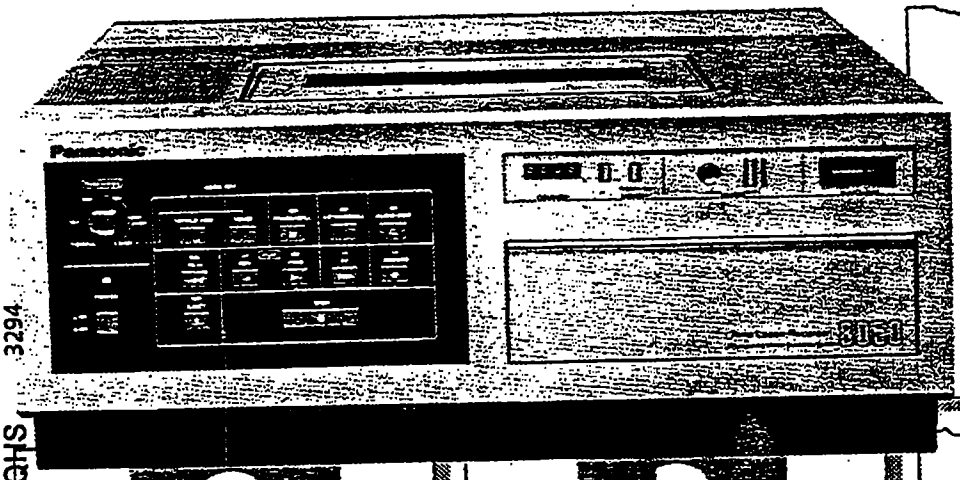
QHS 3293

PANASONIC'S NEW TIME-LAPSE VIDEO. THE 10-DAY WONDER THAT WILL LAST FOR YEARS.



1

Incredibly, the new Panasonic NV-8050 can continuously monitor time-lapse action direct from a video camera for up to ten days on a single ½" cassette.

2

It's an achievement made all the more impressive by the fact that although the NV-8050 is a highly sophisticated unit, it's delightfully easy to use.

3

That's because it's been specially designed for time-lapse recording, and that's why it offers a wide range of operating speeds including the particularly useful one-shot mode.

4

All of which makes it suitable for a wide variety of security and scientific uses where, until now, time-lapse recording was both complex and costly.

5

Features of the NV-8050 include forward and reverse playback with alarm-activated recording and location facilities.

6

Single field playback is possible for close, accurate picture checking, and with a horizontal resolution of 310 lines b/w, the picture quality is impressively high.

7

Plug in the optional time and date generator and there's instant playback identification of recorded data.

8

Couple to all this the massive 240 hour time-lapse programme and you'll begin to realise just what a practical unit the NV-8050 is.

9

And because it's built by Panasonic, you can be sure that this is one 10-day wonder that really will last for years and years.

10

Please send me details of your 10-day wonder, the new NV-8050 time-lapse video.

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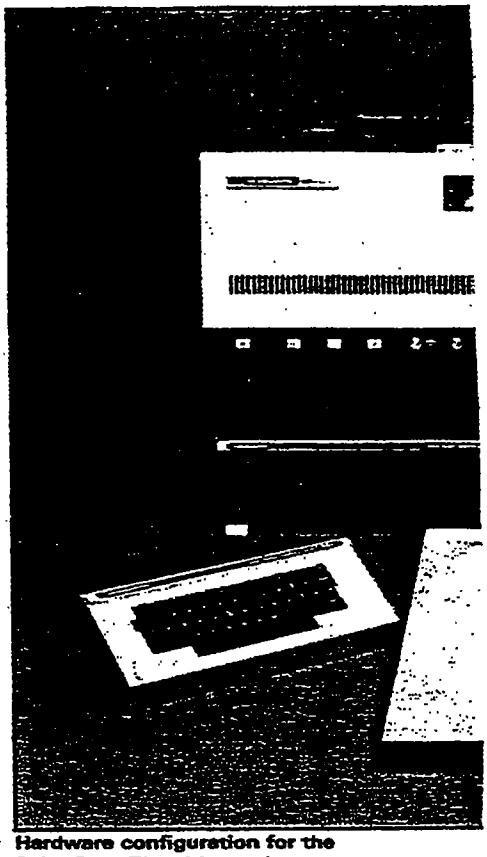
Formats for a free press

Raising issues, continuing trends — George Jarrett visits NAB and looks at its consequences, here and across the Atlantic



Hardware configuration for the Paint Box. The video artist 'paints' pictures, like the one on the right, using the stylus on the touch tablet

The 1982 NAB will not be remembered for its technological innovations — despite Panasonic's advertisement claim that *Recam* 'redefines freedom of the press' — but for the issues it raised, and for the continuing trend that sees quality products costing less by the year.

Pre-eminent among the issues was the call for the American Government to create a real free press by removing the Fairness Doctrine and Equal Time provisions to give the electronic media full First Amendment rights. This came at the opening session from NAB president Vincent T Wasilewski, who said: 'If this is to be the threshold decade of the communications age, broadcasters must have the freedom to seek out and report information without government oversight which could easily become government censure.'

Wasilewski's attack on the regulatory structures that 'hamper and stifle quality coverage of important issues' was the start to a determined campaign that NAB is to mount in the coming months throughout the media and on Capitol Hill.

For radio people the big issue was whether or not stereo AM should be adopted. For those that are fed up with NTSC, PAL and SECAM, CBS led the lobby demanding a single world standard to serve the needs of news-gathering and international production.

Those that use NAB as a shop window will have missed the issues and been happy enough to get lost among the 435 exhibitors inside the Dallas convention hall and the 20 outside in the satellite park. The time that elapses between the NTSC launch of a major new product and its appearance in Europe has been reduced (on average) to six months, so an educated scan through the hundred or so newcomers in Dallas gave a good indication of what will be 'new' here in October through to the end of the year. In some cases — Hitachi's FP-21/2 for example — products are launched simultaneously on the US and European markets, but for the majority, IBC in September will be used as the PAL launchpad.

True highlights from the exhibit could be counted on two hands but there were several trends, such as a 40 percent cut in the cost of getting into one-inch, that kept the interest-level very high.

Sony and Ampex particularly have decided to push for expansion of the C-format with amazing value-for-money machines that make the advantages of using a broadcast format so much more attractive to professional video companies, and particularly to the small and medium-sized facilities operations that previously have had to go with BVU.

Sony is in for a rough time if the VHS combos like *Recam* and *Hawkeye* get SMPTE standards' blessing because by protecting its marketing interests with C-format it will lose out on U-matic.

Betacam was a notable absentee from the team — Panasonic, RCA, Hitachi, Ikegami and NEC — pushing Chroma Trak for SMPTE standards approval

Camera news was consistent with VTR news: better performances for less money and more companies than ever offering viable options to those about to make a buying decision. The professional industry that exists in the US underneath broadcasting is so big it can take 50 models in the £2-10 000 price range.

Compared to the UK, a far higher percentage of these customers come from in-house corporate production facilities — a fact confirmed by the ITVA convention that followed NAB — and not from facilities operations. Thus the good news from NAB has a different significance to the London video business than to the average ITVA member in the US.

English visitors encountered in Dallas opined that the effect NAB would have at home would be to reduce the cost of hiring camera crews and of buying editing time. It will also mean that a number of companies outside London will be able to move to C-format and undercut the London houses.

Operations like Nigel Reynold's Red-apple will have to look seriously at offering shooting with cheaper cameras and at cheaper rates. The broadcast cameras — Sony 330 and Ikegami 79 for example — common to non-broadcast crews are no longer critically superior to Hitachi's FP-22 and even to its one-tube FP-10, which retails at less than £3000.

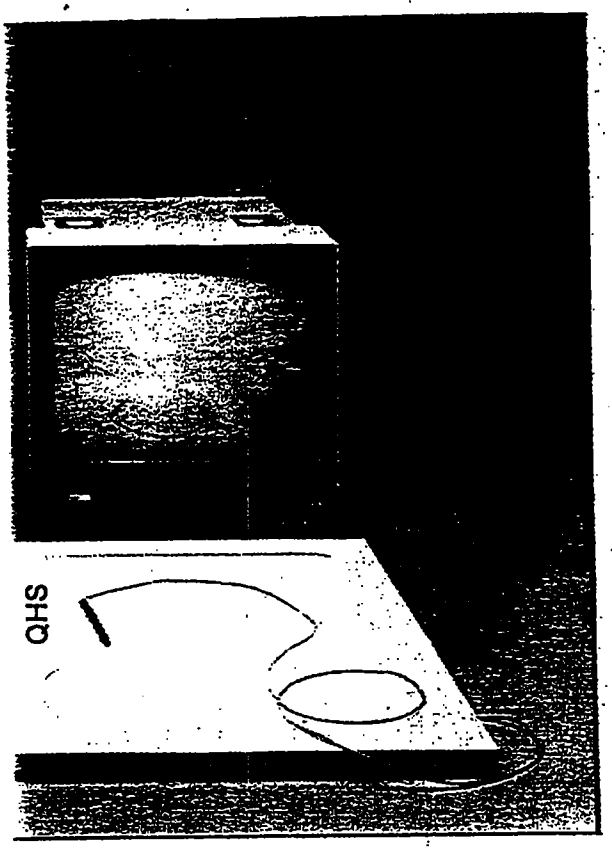
The advice to anyone in the UK thinking that spending money on the production of some programmes and then buying professional facilities time is a bargain: leave in-house installations alone for the time being.

For the freelance producer the big advance at NAB was the launch of the first full function VHS editing system. For about £5000 it will be possible to do offline editing when and wherever the fancy takes you, before presenting the programme and a set of code numbers for on-line assembly and tidying up.

If 20 or 30 producers catch on to that idea, editing costs will drop and the resulting competition for work will kill off those not giving top-quality service.

NAB 1982 heralded a buyers market and a continuation of the boom in television usage. For Americans it also heralded a fight with the Reagan administration that the public won't understand because it is already over-served with 'news'.

DALLAS '82



Quantel leads the illusion game...

A key characteristic of big shows like NAB is the way in which companies hide their latest equipment innovations in hotel suites, well away from the exhibition floor, so that they can control their audiences.

Quantel — exhibiting as MCI/Quantel — won the plaudits for pushing the boundaries of TV technology back the furthest with *Mirage*, an exciting new system for picture manipulation it had housed in a suite at the Loews Anatole hotel, five miles away from the Dallas convention centre.

It introduced the final production version of its *Paint Box* digital art system with a live show on the stand, which concluded with a lone TV image waving like a flag in a breeze.

Visitors were teased into asking for an invitation to see Mirage and, in the process, treated to a good introduction to the Paint Box. In both instances, would-be buyers need big purses — the Paint Box costs about £80 000 and Mirage will cost in the region of £160 000 when it becomes available next year. The next big landmark is to see it set up and working in PAL at IBC.

Quantel's arrangement of showing this year's new product while next year's new product is waiting in the aisles in prototype form was impressive, but over a few years it could prove very demanding. Having made the bus ride to Loews Anatole to sit among an audience of technology-hardened American network men exclaiming 'Jesus' and 'How do you do that?', it's difficult to imagine what the company could come up with after Mirage.

It was introduced as 'the ultimate illusion', a picture manipulator that creates in real time what could only have been produced previously with film optical techniques that take time and money. The initial impression of all the illusions is that fidelity, picture compression and smoothness of image movement are exceptional.

George Grasso, president of MCI/Quantel, introduced Mirage as an open-ended system, claiming that it will 'let you make virtually any picture manipulation you can imagine, perform any illusion, satisfy any whim.

'We're totally unleashing creative people. Now, for the first time, you can create what you can conceive'.

What does Mirage offer? In addition to the standard effects available with products like Quantel's own DPE 5000 — such as electronic zooms, tumbles, flips, picture splits and enlargements shrinks — it will rotate pictures along any axis, add perspective and swirl pictures into a whirlpool, with the outer sections turning faster than the inner. Pictures can be rolled into a cylinder, which itself can be created in varying degrees of transparency or as an opaque.

The hidden parts can be revealed either by tipping the cylinder or by the see-through effect.

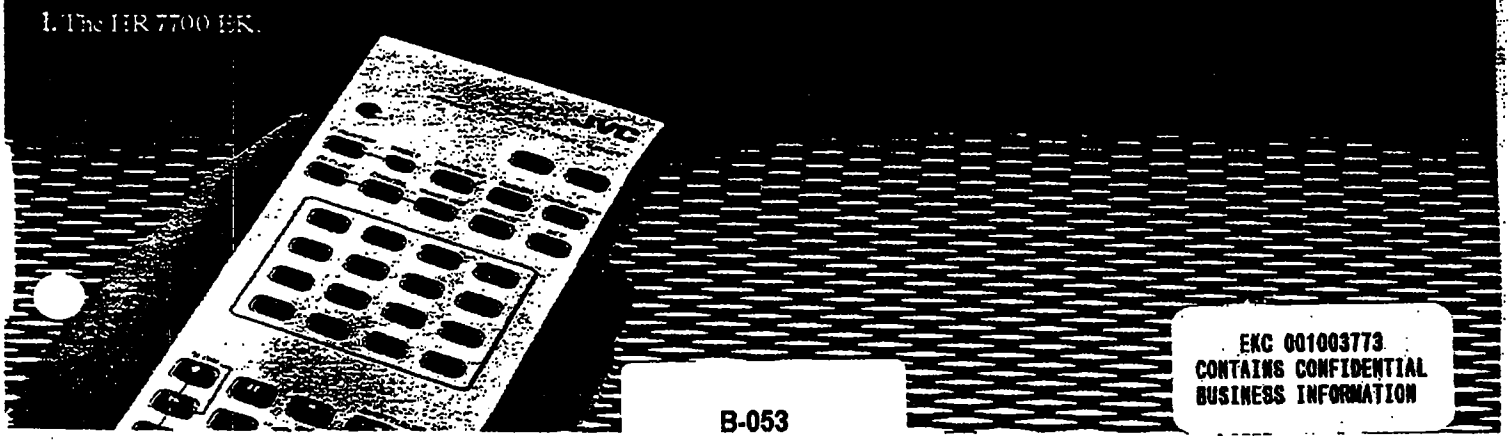
Simulated page turns revealing the back; the use of a globe, helix, cube or ellipse instead of the cylinder and the ability to speed a picture away into nothing and bring it back just as smoothly were just a few of the highlights of the demonstration. It was stated that the effects programmed for NAB were not born of mathematical genius, but of standard algebraic language.

Quantel is keen to see this expansion of its 5000 concept find applications outside the usual broadcast television areas attracted to NAB, and it has come up with what it calls the 'off-line creative work station' to facilitate this. This would allow effects to be created and programmed without tying up the main machine. In such a set-up there could be several work stations linked to one master centre. Explaining this, Grasso felt that the new system would be 'ideal for advertising agencies, film-makers, and others who can do creative work on their own premises, then finish up at a facility with a central Mirage unit.'

Wishful thinking (on Quantel's part) would have Molinare or the Moving Picture Co laying out the £160 000 for the central unit, to do business with

•turn to P45

Total Vid



1. The HR 7700 EK.

B-053

The JVC guide to complete home video from cameras to tapes to recorders.

JVC invented VHS the world's most popular home video system. So it's hardly surprising that they make the widest range of recorders, cameras and video accessories available in this country. Whatever you're looking for in video, JVC make it.

1 No VHS video recorder offers you more than the HR7700EK. It's front loading, with a 14 day/8 programme timer, and full function infra-red remote control. The 'shuttle search' plays backwards or forwards at 10 times normal speed. So you can quickly find the exact spot you want on any tape. You can play back at a variety of speeds.

Only JVC could make a video recorder so advanced yet so simple to use.

2 You can't make a better start in video recorders than the low priced HR7300EK. It has an 8 programme/14 day timer, shuttle search and Dolby* noise reduction system. And just to make life easier the HR7300EK comes complete with a full function remote control.

If you would like to save even more money then the HR7200EK is the video recorder for you.

It offers you full recording and playback facilities including shuttle search and a one programme/10 day timer.

Whichever you choose you can't go wrong with JVC.

3 Now there's a video recorder that's light and compact enough to be taken anywhere – the HR2200EK. At home it will give you the brilliant picture quality you expect from JVC; take it away with you and team it with

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•from P41

work stations located in the offices of companies like Young and Rubicam, Benton and Bowles, Ogilvy and Mather and J Walter Thompson.

Paint Box was introduced by Quantel as a 'breakthrough in terms of the types of graphics that can be generated and in the fidelity of the images produced'. It comes onto a market full of competition — from the likes of Flair and Ampex's art system — but ready to interface to the existing DLS 6000 digital library system, or to a standard video tape library via the 6000 tape back-up system.

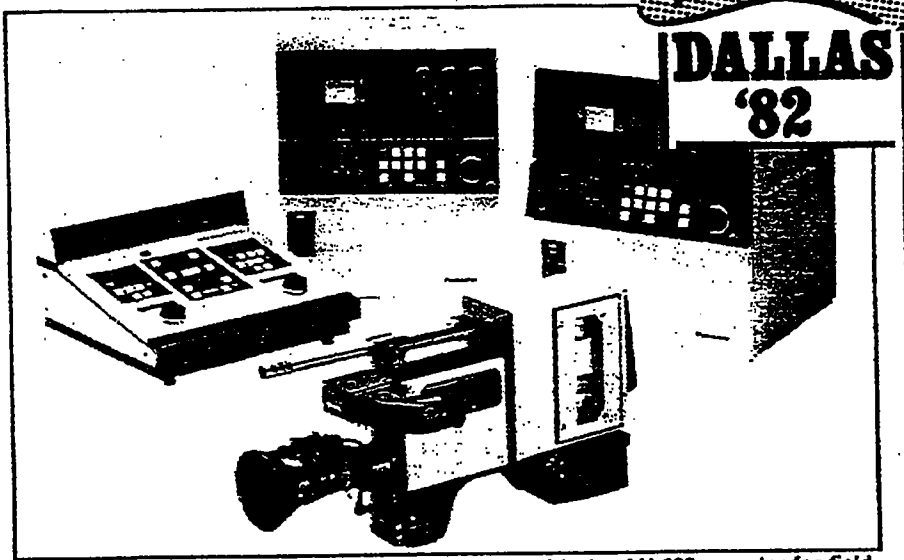
Bringing the artist into television seems a strange contradiction of harsh against soft touch. But Paint Box really is the equivalent of 'brush and palette'.

key judgment is whether or not the hed video image is achieved without the serated line effect that colour mixing in video creates. In fact, Quantel's demonstration showed very smooth matching even where single colours and different strengths and mixes of colour overlap.

Capabilities of the Paint Box start with free-hand, painting by numbers following standard graphic outlines, retouching existing video pictures, high quality character generation, assembly either by picture build-up or overlays, re-positioning or re-sizing pictures, basic animation and soft blending.

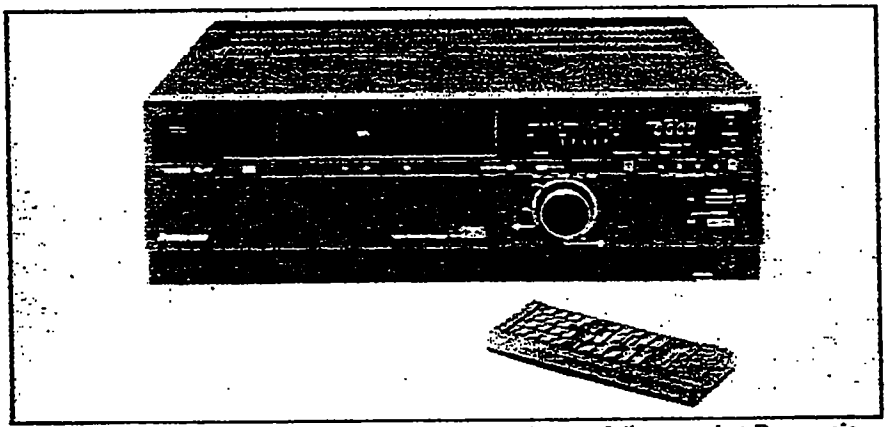
To the experienced TV eye, its most impressive performance is in the mixing of colours and the fine detail the cursor is able to paint into a scene. To the operators — and there will not be too many of them — beyond the touch tablet and stylus there is a frame store, which replaces the computer used in first generation graphics systems, a floppy for single picture storage, and a chester-type disc for storing up to 300 pictures or part pictures.

If modern day Constables are to choose the stylus rather than the brush, it will be on behalf of network TV, and not in the hope of making their name once they are dead. However, the Paint Box and Mirage are not elitist products belonging to the long broadcast tradition of 'amaze but don't serve'. They give insight into what can be done with television and into the creative requirements of the human control element. Doubtless, in five years time all these effects will be commonly available, at a tenth of the cost and up to 50 times as many end-users. □



The *Recam* system combines the *AK-100* camera with the *AU-100* recorder for field recording. Post-productionis with the *AU-A30* editing controller and the *AU-300* studio VTR

Panasonic raises another standard



High and low-band VHS looked a future likelihood, especially now that Panasonic has introduced the first full function editing suite. The *NV-8950* dynamic tracking VHS made a big impression on the US corporate buyer, and looks likely to be the source machine when the edit suite is introduced in PAL this September

Panasonic produced its most telling contribution yet to a major international show. In the muscular guise of its parent, Matsushita, it proved to be group leader of the standards assault on SMPTE, and on its own behalf it provided a boost to professional aspirations (shared with JVC) for the VHS format. It also produced several new cameras, news of a move into broadcast standard monitor production, and a new high-grade tape giving superior S-T-N performance.

On April 2 — two days before NAB opened — we were told: 'Matsushita Electric Industrial Company has submitted a proposed standard for a broadcast-quality half-inch videotape recording system to the SMPTE'. Agreement had been reached to 'OEM the recording portion of the system to Hitachi and Ikegami'. RCA, with its *Hawkeye*, was already there.

The quality of picture produced by *Recam* (*Hawkeye* from RCA, *S R-10* from Hitachi and *HL-83* from Ikegami) falls between BVU and C-format. If a standard is granted, these four companies are going to pose a big threat to the future of BVU. The fact that Sony is the only company pushing high band U-matic, and that Betacam does not match the four mentioned here, may have serious ramifications on the companies hierachy, bringing Panasonic up to a stature it could have assumed a decade ago.

Recam was introduced as 'ideal for interfacing with existing studio equipment'. This is not strictly true because buyers get a system which comprises in-camera VTR, studio VTR and electronic editing controller. Yes, this lot does 'interface' with existing equipment, but at a price that makes C-format and separate broadcast cameras look better bets for the time being.

•turn to P46

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Sony inches in...

The big success for Sony came with its new *BVH-2000* C format machine, which brings down the cost of updgrading to one-inch broadcast machines by about 40 percent.

...but is U-matic on the way out?

Sony Broadcast's position at the head of the professional market — alongside the likes of Ampex, Tektronix and RCA in the US, and some would say dominant in Europe — has been achieved in only four years.

It did not amaze anyone at NAB, but it did present several 'new' or 'improved' products that can only enhance its market strength. It was too the victim of a little gang warfare at the hands of RCA, Matsushita, Ikegami and Hitachi, whose SMPTE ½-inch standards initiative excluded *Betacam*.

Sony's principal newcomer was the *BVH-2000* C-format VTR. This is an important machine given Marconi's incursion with the *MR2B*, 3M's new *TT-7000* and Ampex's new budget-priced *VPR80*, which made a huge impact with its $36 000 price tag.

The latter two and the BVH-2000 particularly indicate that the C-format is becoming very competitive in price and performance terms. There is too an element of 'customisation' about the new machines that brings to one-inch the flexibility non-broadcast users need if they are to put together a package they can first afford, and then add to.

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•from P45

Recam weighs 22lbs — 4.5lb more than Betacam. It is somewhat cumbersome as yet but it looks convincing enough in performance. It gives 20-minutes of recording (at 204.5 mm per second) on a 120-minute VHS cassette, but the track configuration bears no resemblance to the home format. Using an *M-format*, there are four recording heads: three video (Y, I and Q) tracks are complemented by the multiplexing of the I and Q signals to avoid intermodulation, and there is still space for two audio plus control and time-code tracks. The studio machines have two flying erase heads in addition to the four recording heads. SMPTE time-code is built-in. When the tape is stopped, it automatically back-spaces 45 frames, with the next recording sequence starting on the last two frames upon restart. Input from the cardioid mic on the camera head goes onto audio channel 1.

Tube options for the camera are Saticon or Plumbicon (both ⅔ inch). The Saticons achieve a resolution of 550 lines and an S-N-R or 59dB. The Plumbicons will give a 600-line resolution and the same dB performance.

'Special features' highlighted by Panasonic are the inclusion of feedback beam control, two-line vertical aperture correction, black stretch and corner registration circuitry. The camera also has auto white and black balance controls, colour bar generator, high gain selections of + 9dB and + 18dB, auto iris circuit and lens close, and adjustable blanking width. Key to the compatibility of the AK-100 camera with other recorders is the genlock adaptor.

The studio VTR — *AU-300* — and the editing controller — *AU-A30* — are not quite as convincing as the field end of the Recam system, probably because the best use of professional half-inch is for picture origination for subsequent post-production on one-inch. In fact, the pricing details revealed at NAB by RCA and Panasonic reflect as favourably on C-format as the technical achievements of the new format reflect badly on BVU.

The AU-300 has complete direct drive operation, head switching in vertical interval and dub capability. Impressive features are the inherent drop-out compensation and audio limiter. It has insert or assembly edit, split audio and video edits and microprocessor-controlled tape transport. Accuracy on the editor is said to be + 2.

Panasonic's pursuit of professional recognition for VHS did not just hinge entirely on the Recam — it also introduced an editing system that will cost only $8000 in the US, a dynamic tracking recorder with five-motor piezo head system, and a new high-grade tape. And as if that was not enough, it also introduced three new cameras of which the *WV-777* is the most likely to make an impression on the European market.

For $8000 — which will become £5-6000 when the system is sold in PAL — the user gets two NV-8500 editing recorders, NV-A500 edit controller and remote search controller and multi-source switcher. When we questioned the NTSC picture quality — probably from a PAL bias — the Panasonic representative giving the demonstration retorted: 'So what? Over here, they're as excited as hell for it'.

The demise of what we call low-band U-matic looks more likely now there is a full function VHS editing system. The American market will go for this product in a big way, probably forcing Sony to re-think its industrial Betamax ideas as well as its Betacam situation. The US could well force low and high-band VHS standards in the same way that Europe has low and high-band ¾-inch at present.

The *NV-8950* gives noiseless variable playback in forward and reverse and the best still-frame yet seen from a VHS player. The picture is impressively clear of bars in 10x forward and 5x reverse shuttle. All this is achieved with four heads and a ring-shaped piezo-electric actuator which moves the two playback heads in alignment with the recorded video-tracks.

To help get better pictures still from industrial VHS, Panasonic introduced a new high-grade tape that has benefitted from advances in back-coating technology. A smoother base film has improved tape-running, and a superior signal-to-noise performance is achieved courtesy of a new super corpuscle magnetic substance.

Panasonic's claim that the *WV-777* gives 'advance ENG and EFP performance at a modest price' is a fair one. It will give strong competition to the JVC, Sharp and Hitachi equivalents in the US, and it could play an important part in boosting Panasonic's market prowess in Europe.

It has three Saticon tubes linked to an 'efficient' prism optics system, and gives (in NTSC) 550-line horizontal resolution at centre and 55dB S-N-R. It has horizontal and vertical image enhancers, automatic beam control to reduce blooming and comet tailing, and digital auto white and black circuits with memory, which speed-up set-up. The field viewfinder is 1.5-inch. Complete camera weight is only 11lb. For studio work there is a five-inch viewfinder plus lens options and remote control unit.

'Convenience features' include selectable audio gain, which gives flexibility to mic selection; built-in colour bar generation; sync with genlock for multi-camera set-ups; intercom level control; 6 and 12dB gain switches; switchable audio output level of —20dB or —70dB; and, gamma correction adjustable from .45 to 1.0. The camera can be put on 'stand-by' to reduce power consumption when idle.

United States Patent [19]

Beaulier

[11] **Patent Number: 4,821,121**

[45] **Date of Patent: Apr. 11, 1989**

[54] **ELECTRONIC STILL STORE WITH HIGH SPEED SORTING AND METHOD OF OPERATION**

[75] Inventor: **Daniel A. Beaulier, Menlo Park, Calif.**

[73] Assignee: **Ampex Corporation, Redwood City, Calif.**

[21] Appl. No.: **18,786**

[22] Filed: **Feb. 24, 1987**

Related U.S. Application Data

[63] Continuation of Ser. No. 740,297, May 31, 1985, abandoned, which is a continuation of Ser. No. 483,327, Apr. 8, 1983, abandoned.

[51] Int. Cl.[4] H04N 5/14

[52] U.S. Cl. 358/160; 358/183

[58] Field of Search 358/160, 183, 311, 342, 358/102; 360/35.1, 9.1, 10.1, 14.1

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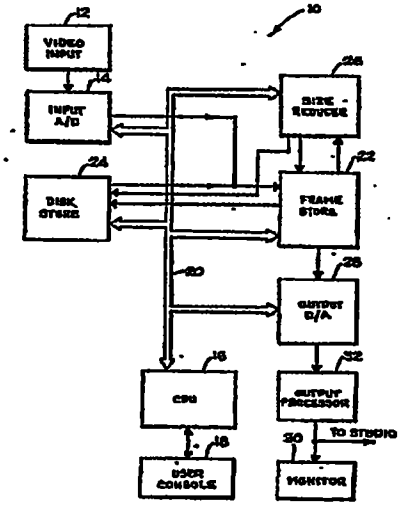
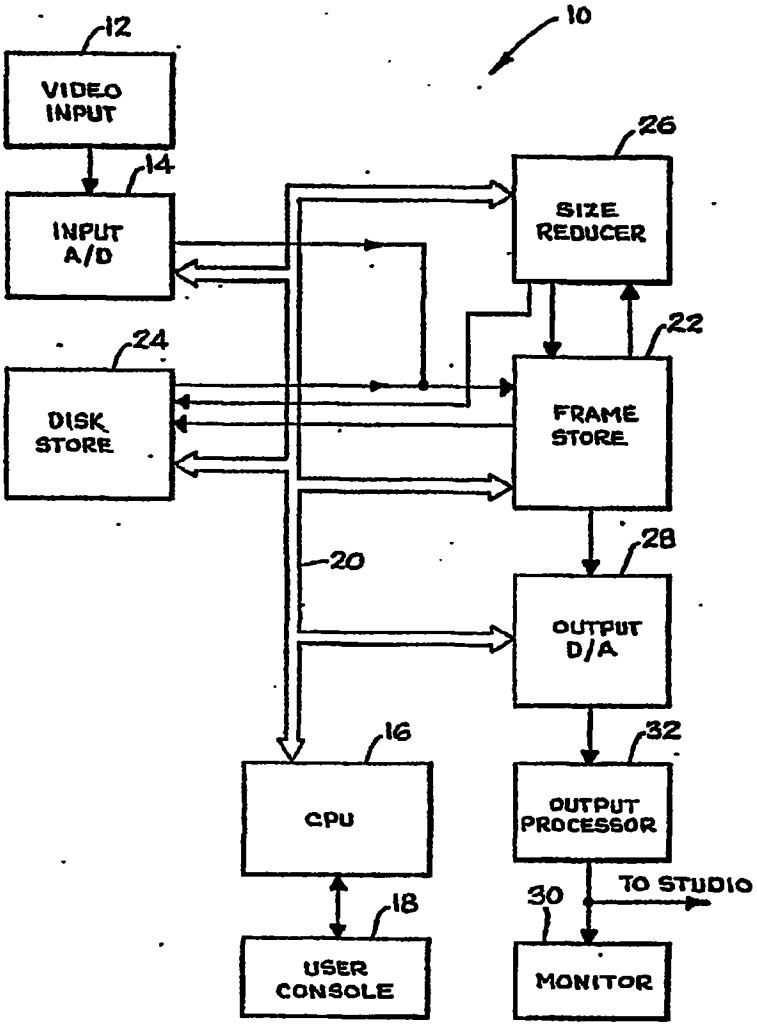
Primary Examiner—Edward L. Coles, Sr.
Assistant Examiner—David E. Harvey
Attorney, Agent, or Firm—Bradley A. Perkins; Ronald C. Fish; George B. Almeida

[57] **ABSTRACT**

An electronic still store system stores and selectively outputs video image data defining a plurality of signal frame still images. The simultaneous display of up to 16 or more quarter sized images for scanning or sorting by an operator is facilitated by generating a quarter sized copy of each newly received image frame and storing both together on a conventional magnetic disk storage device as is typically employed in general purpose digital computing systems. The quarter sized image can then be recalled directly for a multi-image scan or sort function in which 16 reduced size images are displayed simultaneously without the time delays associated with the retrieval and size reduction of 16 full size images.

15 Claims, 1 Drawing Sheet




10
12
VIDEO INPUT
14
INPUT A/D
26
SIZE REDUCER
22
24
DISK STORE
FRAME STORE
20
28
OUTPUT D/A
16
32
CPU
OUTPUT PROCESSOR
TO STUDIO
30
18
USER CONSOLE
MONITOR

ELECTRONIC STILL STORE WITH HIGH SPEED SORTING AND METHOD OF OPERATION

This is a continuation of application Ser. No. 740,297, filed on May 31, 1985, now abandoned, which is a continuation of application Ser. No. 483,327, filed Apr. 8, 1983, now abandoned.

BACKGROUND OF THE INVENTION

This invention relates to a digital electronic still store for broadcast television signals and more particularly to a still store providing a high speed multiimage scan or sort capability.

Digital electronic still store video display systems store a plurality of frames of video images on relatively low cost magnetic disk storage. Any selected one of the stored image frames may then be communicated to a frame store from which data defining the image is repetitively read out to generate a continuously displayed television image. The still store image can then be combined with a second image to create a combined video image. For example, it is common to insert a selected still store image depicting a news event in the upper left hand corner of a live studio image depicting a newscaster describing the news event.

The disk store is capable of storing a large library of single frame images and it is often desirable to generate a reduced size multiple image picture for editing or other purposes. For example, it might be desirable to create a special effect with multiple images or an editor may wish to view and compare several images at the same time for the purpose of selecting those images which will be used in a television broadcast. However, each of the several images which are to be simultaneously displayed must first be read from the disk store as full size images and then reduced for insertion into the multi-image display. This process takes $\frac{1}{4}$ to $\frac{1}{2}$ second for each image and results in a delay of several seconds for the composite multi-image display. Such a time delay is at best disconcerting for a busy editor and precludes use of the editing features of the system during a real time broadcast.

U.S. Pat. No. 4,172,264, "Control Arrangement for Video Synchronizers", to Taylor et al describes an arrangement in which joysticks may be used to selectively position video images on a television display. The system requires full sized images to be accessed and then reduced in size as described above.

U.S. Pat. No. 4,302,776, "Digital Still Picture Storage System With Size Change Facility", to Taylor et al discloses a still store system in which multiple images may be accessed and reduced in size for simultaneous display as discussed above. The suggestion is made that an array of reduced size images be stored as a single image frame. This has the effect of eliminating the time required to reproduce the array but precludes the flexibility of choosing or repositioning any desired images when recalling the array. Furthermore, the aforementioned time delays are encountered when assembling the original multi-image display.

SUMMARY OF THE INVENTION

An electronic still store system in accordance with the invention rapidly generates and outputs for display to an operator a still image frame comprising a plurality of selectively positioned, reduce size images which may be simultaneously viewed for scanning or editing purposes. The system includes an image store for storing therein a plurality of frames of video images with both a full spatial resolution copy for full size video output and a reduced spatial resolution copy for reduced size video output of each image being stored, and a frame store which is operable in a first mode to receive from the image store, store and repetitively generate a full spatial resolution output image frame. The frame store is operable in a second mode to receive from the image store and store a plurality of reduced spatial resolution image frames. The frame store is further operable in the second mode to repetitively generate an output image frame having an image from each of the plurality of reduced spatial resolution image frames selectively located at a different position within the output image frame.

The system may further include an image size reducer coupled to produce a quarter size reduced spatial resolution image in response to a full resolution image stored by the frame store, a video input, an analog-to-digital converter coupling the video input to the frame store, a monitor for viewing output video images and an output digital-to-analog converter coupled to convert the output video images from a digital form to an analog form for use by the monitor. A central processing unit is connected to receive user commands through a user console and to control the other devices of the system in response thereto.

The image store employed herein is a general purpose magnetic disk storage system as is currently used in general purpose digital computer systems.

In operation the system can rapidly assemble an array of 16 reduced size images for output as a single image frame. A system operator may view the reduced size images simultaneously for rapid scanning of some or all of the stored images within the image store, which is preferably a magnetic disk. Because the images are read from the image store in reduced size and spatial resolution, the output image formation time is approximately the $\frac{1}{4}$ to $\frac{1}{2}$ second required to transfer a single full size image instead of the several seconds which would be required to transfer 16 full size images prior to resolution reduction and storage as a reduced size image.

Using this system an operator may rapidly scan many still frame images which are stored by the image store or may compile lists of randomly selected image frames for simultaneous viewing as an array of reduced size images. Because of the rapid response rate the system becomes feasible for development and outputting of data frames containing multiple reduced size images on demand during a television broadcast.

BRIEF DESCRIPTION OF THE DRAWING

A better understanding of the invention may be had from a consideration of the following detailed description taken in conjunction with the accompanying drawing in which the sole FIGURE is a block diagram representation of an electronic still store system in accordance with the invention.

DETAILED DESCRIPTION

Referring now to the sole FIGURE, a digital electronic still store system 10 for rapidly assembling as a single image frame an array of reduced size images is shown as including a video input circuit 12. The video input circuit 12 may be another electronic still store system, a TV camera, or some other source of video data from which one or more frames of a video image

may be captured. In the preferred embodiment of the electronic still store system 10, the video signal is processed in component form. A method and apparatus for producing the component information which may be employed is more fully disclosed in the U.S. Pat. No. 4,675,876, issued Sept. 22, 1987 to D. Beaulier, which is assigned to the same assignee as this application, which is incorporated by reference herein. Therefore, the video input 12 will include appropriate video signal decoding means to process video data received from sources that provide the data in an encoded form.

An input analog-to-digital (A-D) converter 14 is coupled to receive an input video signal provided by the video input circuit 12, which typically includes video signal processing circuitry that prepares the signal for conversion by the A-D converter 14. The A-D converter 14 converts the input video signal to a digital form which is suitable for handling and processing by digital circuitry. The input AD 14 receives the video signal from the video input 12 and converts the video signal to the digital sampled data form in which each pixel of video data is represented by three eight bit data bytes defining respectively luminance, red chrominance and blue chrominance components. Conventionally, the chrominance data has half the spatial resolution of the luminance data in the horizontal dimension so that data is produced in a repetitive 4 byte luminance/chrominance component sequence of L1, CR1, CB1, L2—L3, CR3, CB3, L4 and so forth. The single byte representation affords a high dynamic resolution of 256 distinguishable states for each color component. For adequate dynamic resolution, each video component at a sampled data point is preferably defined by at least 6 binary bits providing 64 distinguishable intensities. A central processing unit (CPU) 16 formed from a Z80 microprocessor is connected to receive operator commands from a user console 18. CPU 16 is connected for bidirection communication of commands and other data over a system bus 20. The system bus 20 is connected to input A-D 14 as well as other major components of the still store system 10 to carry the address, mode select and status information required to control the operation of the still store system 10.

A frame store 22 which in the preferred embodiment is a random access memory, is coupled to receive mode control information from CPU 16 over system bus 20 and to receive video data representing a frame of a video image from either input A-D 14 or from a multiple frame image store implemented as a magnetic disk drive store 24 in the preferred embodiment but which can be any bulk storage memory device in other embodiments. Frame store 22 is a random access store that is capable of storing more data than is required for a single video image frame.

The storage capacity provided by presently available 64K memory chips enables storing up to 750 lines of video data. In any event, out of a 525 line NTSC frame of data only about 484 lines represent video data. Because of the two dimensional nature of a video image a quarter size image defined by video data having one-fourth the spatial resolution of a full size image requires one-sixteenth the storage capacity of a, full size, full spatial resolution image. A quarter resolution image thus requires the equivalent storage of 30 lines of a full resolution image. In any event the frame store 22 either contains initially or is expanded to contain, storage of video data representing a full resolution full size image, as well as a quarter resolution copy thereof.

A size reducer 26 is connected to be controlled by data from CPU 16 received over the system bus 20. Size reducer 26 is operable to receive video data from frame store 22 to convert the video data to a quarter spatial resolution copy thereof, and communicate the quarter resolution copy back to frame store 22 for storage therein. In a similar fashion, when video data received from disk store 24 does not contain a corresponding quarter spatial resolution copy, size reducer 26 may be employed to generate a quarter spatial resolution copy for subsequent transfer to either frame store 22 or disk store 24. Hence, any time frame store 22 receives a video image frame that does not have a corresponding quarter resolution copy, the size reducer 26 may be used to make such a copy.

As a new frame of video data is transferred from frame store 22 to disk store 24 for more permanent storage, both the full resolution and the quarter resolution copy are transferred. Since the quarter resolution copy is represented by only one-sixteenth the data of a full resolution copy, the communication and storage of the quarter resolution copy imposes only a small burden on both system operating time and extra storage space requirement within disk store 24. It should be noted that disk store 24 is a general purpose magnetic disk storage device as is commonly used in connection with general purpose digital computing systems.

During system 10 operation frame store 22 repetitively accesses stored video data to generate a continuous stream of output video data frames representing the stored image. An output digital-to-analog converter 28 receives this digital output data and converts it to an analog video signal which is subsequently supplied to output processor 32. Output processor 32 is a conventional video signal output processor, for forming a television signal in a standard format, which can be used to drive a monitor 30 for viewing of the output video image by a system monitor. The analog video signal form may also be communicated to studio equipment for further use, broadcasting or storage.

When operating in a first, normal broadcast mode, frame store 22 receives a full resolution frame of video data from disk store 24 and outputs a continuous television image in digital data form in response thereto.

In a second, editing or browsing mode, CPU 16 commands disk store 24 to output reduced resolution image data which is selectively positioned in frame store 22 for viewing in one of 16 reduced size image positions in a 4×4 array as a mosaic which fits within a normal full size image. Under operator control, the 16 viewable images may be taken sequentially from disk store 24 starting with a selected image frame. This mode is useful when scanning all of the images stored by disk store 24. Alternatively, the 16 images may be taken randomly from a list of stored images developed by the operator. This mode is especially useful when it is desired to compare certain images.

The 16 image assembly time is greatly reduced because only an amount of data equivalent to one full size, full spatial resolution, image need be transferred from disk store 24 to define all 16 images. This is only one-sixteenth of the time that would conventionally be required.

While there has been shown and described above, a particular arrangement of an electronic still store system which can rapidly compose a multiple image frame of data, for the purpose of enabling a person skilled in the art to make and use the invention, it will be appreci-

ated that the invention is not limited thereto. Accordingly, any modifications, variations or equivalent arrangements within the scope of the attached claims should be considered to be within the scope of the invention.

What is claimed is:

1. An electronic still store system comprising:

an image store means for retrievably storing therein a plurality of image frame copies of video frames, the image frame copies comprising data representing full spatial resolution images and corresponding data representing reduced spatial resolution images of the video frames;

frame store means for receiving and storing in a first mode one of said full spatial resolution images from said image store means and for repetitively generating a full spatial resolution image output, and in a second mode for receiving from the image store means and storing a plurality of said reduced spatial resolution images each at selectively located different positions, the frame store means in the second mode further repetitively generating an image output comprising the stored plurality of said reduced spatial resolution images; and

size reducer means for receiving from the frame store means the stored full spatial resolution image and in response thereto returning to the frame store means a corresponding reduced spatial resolution image, wherein the frame store means receives and stores the returned reduced spatial resolution image while continuing to store the stored full spatial resolution image.

2. The electronic still store system according to claim 1, wherein the reduced spatial resolution images each have a spatial resolution of one-fourth the spatial resolution of the corresponding full spatial resolution image.

3. The electronic still store system according to claim 1, wherein said frame store means includes a central processing unit, controlled by an operator in said first mode for selecting which of said full spatial resolution images stored in said image store means is to be retrieved from the image store means, and in said second mode for selecting which of said reduced spatial resolution images stored in said image store means are to be retrieved and stored in said frame store means, and further for selecting the different positions within a video frame at which each of said retrieved reduced spatial resolution images is stored.

4. The electronic still store system according to claim 3, wherein said frame store means further comprises an output digital-to-analog converter coupled to receive output image data from the frame store means and in response thereto to generate an analog video signal representing an output image; and

a monitor coupled to receive the analog video signal and display the output image represented thereby.

5. The electronic still store system according to claim 4, further comprising a video input means for generating an input analog video signal representing an input video image and an analog-to-digital converter coupled between the video input means and the frame store means for converting the input analog video signal to a digital form such that digital data representing said input video image is received and stored by the frame store means.

6. A video still store system comprising:

external source means for supplying a full size image data set representing a full size image frame;

a size reducer coupled to receive the full size image data set for producing therefrom a reduced size image data set representing a corresponding reduced size image frame;

an image store for storing a plurality of full size image data sets representing a plurality of full size image frames and for storing a plurality of reduced size image data sets representing a plurality of reduced size image frames, each of said reduced size image data sets corresponding to one of said full size image data sets; and

frame store means for storing one of said full size image data sets from either the external source or said image store, wherein if said image store does not supply a corresponding reduced size image data set, said frame store outputs a copy of said full size image data set to said size reducer, and receives in turn a corresponding reduced size image data set;

wherein said image store stores the reduced size image data set along with the previously stored corresponding full size image data set.

7. An apparatus for storing video pixel data representing video images of a first resolution and, for each each of the images at said first resolution, a corresponding video image at a second resolution, comprising:

random access memory means for storing video pixel data representing one of a succession of full size images at said first resolution and a corresponding reduced size version thereof at said second resolution;

bulk memory means for receiving said video pixel data from said random access memory means and for storing said succession of full size images and the corresponding reduced size versions thereof, and for outputting upon a user's command, either a selected one of the successive full size images or selected ones of the corresponding reduced size versions thereof for direct transfer to, and storage back in, said random access memory means; and

means responsive to said random access memory means for selectively generating one of said corresponding reduced size versions from the respective full size image in said random access memory means, and for transferring the video pixel data representing and the corresponding reduced size version back to the contents of said random access memory means.

8. An apparatus for storing video pixel data as at least one full size image at a first resolution, and at least one reduced size image thereof at a second lower resolution, comprising:

random access memory means having an input port and an output port, for storing the video pixel data presented at the input port;

said video pixel data representing the full size video image at a first resolution being stored in a first group of memory locations in said random access memory means;

bulk storage memory for also storing the video pixel data and for presenting selected groups of video data at said input port for storage by said random access memory means;

size reducing means responsive to said random access memory means for directly receiving said video pixel data stored in said random access memory means representing said full size image at said first resolution, and for reducing said image to the re-

duced size image at the second lower resolution, and for supplying said reduced size image at said second resolution directly back to said random access memory means in a second group of memory locations therein;

control means coupled to said random access memory means, to said bulk storage memory and to said size reducing means, for causing said size reducing means to generate said reduced size image at said second resolution and to supply same to said random access memory means in said second group of memory locations; and

said control means further causing the transfer of the full size and reduced size video pixel data from said random access memory means to said bulk storage memory for storage, and for causing the selective transfer from said bulk storage memory directly into said random access memory means of either said full size image at said first resolution or said reduced size image at said second lower resolution.

9. The apparatus of claim 8 wherein said size reducing means produces said reduced size image at said second resolution with one fourth the spatial resolution of said full size image at said first resolution, and wherein said control means determines the transfer of said reduced size image at said second resolution into said random access memory means for storage at a selected one of 16 predetermined groups of said memory locations.

10. A system for storing video data representing video images which are displayable as rasters of vertically distributed horizontal lines, each represented video image normally occupying a raster of selected vertical and horizontal size, the system comprising:

a video image size reducer having an input for receiving video data representing a video image corresponding to the selected raster size and for generating video data representing a reproduction of said video image at a selected fractional-size of said selected raster size;

a first store for receiving video data for storage and for providing video data therefrom, said first store having a capacity for storing the video data representing the video image corresponding to the selected raster size simultaneously together with the video data supplied by said video image size reducer representing said reproduction of the video image at the selected fractional-size;

a second store for receiving and storing the video data stored in the first store and for providing video data therefrom directly to the first store, said second store further storing video data representing a plurality of additional video images each corresponding to the selected raster size, and video data representing a plurality of additional reproductions at the selected fractional size of said selected raster size; and

means for selectively transferring from said second store directly to said first store either video data representing of the plurality of video images corresponding to the selected raster size, or video data representing a plurality of reproductions at the selected fractional-size of said selected raster size.

11. A method of storing video pixel data comprising:

receiving and storing in selected storage locations in a random access memory, full video pixel data comprising a full size image;

generating from the full video pixel data, reduced video pixel data representing a reproduction thereof in the form of a reduced size image at a lower resolution;

storing the reduced video pixel data representing the reduced size image in additional storage locations in said random access memory along with the full video pixel data;

storing both the full size image and the reduced size image in bulk storage memory; and

selectively transferring either the full size image or the reduced size image from said bulk storage memory into said random access memory for further processing.

12. A video still store system comprising:

an external source for supplying a plurality of full size image data sets representative of corresponding full size images;

an image store for storing said full size image data sets, and for storing a like plurality of reduced size image data sets representing a plurality of reduced size images, each of said reduced size image data sets corresponding to one of the full size image data sets;

a memory for simultaneous storage of one of said full size image data sets and a corresponding one of said reduced size image data sets;

a size reducer means for receiving from said memory the stored one of said full size image data sets, and for producing and returning to said memory the corresponding one of said reduced size image data sets;

said memory being responsive to either the external source or the image store for storing said one of said full size image data sets, and for supplying to the image store both the stored one of said full size image data sets and the corresponding one of said reduced size image data sets;

said memory being responsive to the image store to store at different selected locations the plurality of reduced size image data sets;

said memory further supplying as an output image either the plurality of reduced size image data sets arranged at different locations within the output image, or the full size image data set; and

means responsive to said memory for displaying the output image as a raster scanned video display.

13. A method of storing video pixel data for access and display comprising:

providing data sets for a plurality of full size images at a first spatial resolution;

generating, from the data sets of the full size images, second data sets representing a corresponding plurality of reduced size reproduction images at a second lower spatial resolution;

storing both the data sets of the plurality of full size images and the data sets of the corresponding plurality of reduced size reproduction images in respective selected groups of storage location; and

selectively accessing from the storage locations a data, set representing one of the plurality of full size images, and a data set representing one of the corresponding plurality of the reduced size reproduction images, simultaneously.

14. An apparatus for storing video pixel data as at least one full size image at a first resolution, and at least one reduced size image thereof at a second lower resolution, comprising:

random access memory means having an input port and an output port, for storing the video pixel data presented at the input port;

said video pixel data representing the full size video image at a first resolution being stored in a first group of memory locations in said random access memory means;

bulk storage memory for also storing the video pixel data and for presenting selected groups of video data at said input port for storage by said random access memory means;

size reducing means responsive to said random access memory means for receiving said video pixel data stored in said random access memory means representing said full size image at said first resolution, and for producing reduced size pixel data representing the reduced size image at the second lower resolution, and for supplying said reduced size image at said second resolution to said random access memory means in a second group of memory locations therein;

control means coupled to said random access memory means, to said bulk storage memory and to said size reducing means, for causing said size reducing means to generate said reduced size image at said second resolution and to supply said reduced image to said random access memory means in said second group of memory locations;

said control means further causing the transfer of the full size and reduced size video pixel data from said random access memory means to said bulk storage memory for storage, and for causing the selective transfer from said bulk storage memory into said random access memory means of either said full size image at said first resolution or said reduced size image at said second lower resolution; and

wherein said control means also determines the selective transfer of said reduced size image at said second resolution from said size reducing means into said bulk storage memory via the random access memory means.

15. A method of storing video pixel data for access and display comprising:

providing data sets for a plurality of full size image at a first spatial resolution, wherein each one of the full size images occupies upon display a raster of selected vertical and horizontal size;

generating, from the data sets of the full size images, second data sets representing a corresponding plurality of reduced size reproduction images at a second lower spatial resolution;

storing both the data sets of the plurality of full size images and the data sets of the corresponding plurality of reduced size reproduction images in respective selected groups of storage locations;

selectively accessing from the storage locations a data set of one of the plurality of full size images, and one of the sets of the corresponding plurality of the reduced size reproduction images simultaneously;

wherein the step of accessing further includes, retrieving a plurality of reproduction images, storing the retrieved plurality of images in a random access memory, and outputting the stored plurality of retrieved images as a mosaic of reproduction images occupying a raster of the selected vertical and horizontal size.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 4,821,121
DATED : April 11, 1989
INVENTOR(S) : Daniel A. Beaulier

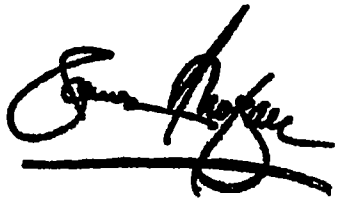
It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Column 6,
Line 46, please delete "and"

Column 8,
Line 61, please delete ","

Signed and Sealed this

Fourth Day of March, 2003



JAMES E. ROGAN
Director of the United States Patent and Trademark Office

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UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office

May 28, 2004

THIS IS TO CERTIFY THAT ANNEXED IS A TRUE COPY FROM THE RECORDS OF THIS OFFICE OF THE FILE WRAPPER AND CONTENTS OF:

APPLICATION NUMBER: *07/018,786*
FILING DATE: *February 24, 1987*
PATENT NUMBER: *4,821,121*
ISSUE DATE: *April 11, 1989*

By Authority of the
COMMISSIONER OF PATENTS AND TRADEMARKS

T. LAWRENCE
Certifying Officer

EXPEDITED PROCEDURE
Examining Group 262

Atty Dkt AMP0035PCON
AV-3033N1
PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

12-12-86

In Re Application of:
DANIEL ~~BOUBLER~~ Caulier
Serial No.: 740,297 Group Art Unit: 262
Filed: 31 May 1985 Examiner: D. Harvey
For: ELECTRONIC STILL STORE WITH HIGH SPEED SORTING AND METHOD OF OPERATION

17/F NE.

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Kathy E McKenna
(Signature of Person Mailing Paper or Fee)

RESPONSE UNDER 37 CFR 1.116
EXPEDITED PROCEDURE
EXAMINING GROUP 262

Box AF
The Honorable Commissioner of Patents and Trademarks
Washington, D.C. 20231

Sir:

In response to the Office Action mailed 3 September 1985, please enter the following amendment.

In the Specification

At page 1, line 11 after "may" and before "be", delete "than" and substitute --then--.

At page 2, line 25, delete "positioned reduce" and substitute --positioned, reduced--.

At page 5, line 1, delete "referred" and substitute --preferred--. At line 27, delete "fourth" and substitute --forth--.

At page 6, line 4, insert after "22" and before "is" --, which in the preferred embodiment is a random access memory,--. At line 8, after "24" and before "." insert --in the preferred embodiment but which can be any bulk storage memory device in other embodiments--

090 12/05/86 740297 1 102 204.00 CK

RW10078 01/22/87 740297 03-1952 010 102 136.00CR

At page 7, line 9, delete "resolutioncopy" and substitute --resolution copy--. At line 16, delete "usedin" and substitute --used in--. At line 19, delete "continous" and substitute --continuous--.

At page 8, line 7, delete "take" and substitute --taken--. At line 6, after "array" and before "within" insert --as a mosaic which fits--.

In the Drawings

Please approve the drawing change marked in green on the enclosed sketch.

In the Claims:

2. (Twice Amended) An electronic still store system comprising:

an image store means for [retrievable] retrievably storing therein a plurality of image frame copies of video frames [of video images], the image frame copies comprising data representing a full spatial resolution image [frame copy] and [a] corresponding data representing a reduced spatial resolution image [frame copy] of each frame of video [images] data;

a frame store means which is operable in a first mode [to receive and store] for receiving and storing one of said full spatial resolution images [frame copies] from [the] said image store means and for repetitively [generate] generating a full spatial resolution [output] image [frame] output and operable in a second mode [to receive] for receiving from the image store means and [store] storing a plurality of said reduced spatial resolution images [image frame copies] each at selectively located different positions, the frame store means being further operable in the second mode [to] for repetitively generating [generate a reduced spatial resolution] output

image [frame having an image frame] comprising [a] the stored plurality of said reduced spatial resolution images [image frame copies selectively located at different positions within the output image frame]; and

a size reducer means [coupled to receive] for receiving from the frame store [a] the stored full spatial resolution image [frame copy] and in response thereto [to return] returning to the frame store means a corresponding reduced spatial resolution image [frame copy] and wherein the frame store is operable [to receive and store] for receiving and storing the corresponding reduced spatial resolution image [frame copy] while continuing to store the stored full spatial resolution image [frame copy].

3. (Twice Amended) The electronic still store system according to claim 2 [above], wherein the corresponding reduced spatial resolution image [frame copies] each have a spatial resolution of [one-forth] one-fourth the spatial resolution of the corresponding full spatial resolution image [frame copies in each dimension].

4. (Twice Amended) The electronic still store system according to claim 2 [above], [further comprising] wherein said frame store means includes a central processing unit, controlled by an operator, coupled and operable in said first mode to select which of said [image frame copies] full spatial resolution images stored in said image store means are to be retrieved from the image store means and coupled and operable in said second mode to select which of said reduced spatial resolution images stored in said image store means are to be retrieved and stored in said frame store means and to select the [location] different positions within the frame store means at which each of

said retrieved [image frame copies] reduced spatial resolution images is stored.

Please cancel claim 5.

6. (Twice Amended) The electronic still store system according to claim [5 above] 4, wherein said frame store means further [comprising] comprises an output digital-to-analog converter coupled to receive [said] output image data [frames] from the [the] frame store means and in response thereto to generate an analog video signal representing the received output image [frames]; and

a monitor coupled to receive the analog video signal and display the output image [frames] represented thereby.

7. (Twice Amended) The electronic still store system according to claim 6 [above], further comprising a video input means for generating an input analog video signal representing [a sequence of] an input video image [frames] and an analog-to-digital converter coupled between the video input means and the frame[s] store means [and] for converting the input analog video signal to a digital form [in which] such that digital data representing said input video image frame [can be] is received and stored by the frame store means.

Please cancel claims 8 through 14.

15. (Amended) A video still store system comprising:

a size reducer coupled to receive a full size image data set representing a full size image frame and to produce a reduced size image data set representing a corresponding reduced size image frame in response thereto;

an image store for storing a plurality of said full size image data sets representing a plurality of full size image frames and for storing a plurality of corresponding reduced size image data sets representing a plurality of reduced size image frames, each of said reduced size image data sets corresponding to one of said full size image data sets; and

a frame store means coupled to selectively receive from either an external source or said image store and store one of said full size image data sets, said frame store [is] being operable such that when a full size image data set is received from an external source or is received from said image store and said image store does not contain a corresponding reduced size image data set, said frame store outputs a copy of said full size image data set to said size reducer and [in response thereto] receives a corresponding reduced size image data set which is outputted to said image store for storage with the corresponding full size image data set.

Please add new claims 16-28.

16. An apparatus for storing video images as pixel data comprising:

means for receiving and storing in a first memory pixel data representing video images having a first resolution, and for generating from said pixel data representing said video image at said first resolution pixel data representing a corresponding image having a second, lower resolution and for storing said second resolution image data with said first resolution image data in a second memory; and

means for selectively accessing either said data for the image at its first resolution or only the

corresponding image data at said second resolution for any image stored in said bulk storage memory for further processing.

17. The apparatus of claim 16 wherein said means for selectively accessing allows access to a plurality of images at said second resolution and storage of them in selected blocks of memory in said first memory so that they may be further processed as a mosaic of reduced size images.

18. An apparatus for storing video pixel data representing video images of a first resolution and, for each image at a first resolution a corresponding video image at a second resolution comprising:

random access memory means for storing video pixel data representing a full size image at said first resolution and a corresponding reduced size version thereof at a second resolution;

means for storing one at a time in said random access memory means a plurality of said full size images;

memory means for receiving video pixel data from said random access memory means and for storing said full size images and the corresponding reduced size images received from said random access memory means and for outputting, upon a user's command, a selected full size image or only the corresponding reduced size image for the selected full size image for storage in said random access memory means;

means for generating said corresponding reduced size image from any said full size image in said random access memory means to be transferred to said memory means and for storing the video pixel data representing said reduced size image in said random access memory means prior to

storage of the contents of said random access memory means in said memory means.

19. An apparatus for storing video data as full size image and reduced size image of pixel data comprising:

random access memory means for storing video pixel data presented at an input port and having at least one output port;

means for storing video pixel data representing a full size video image at a first resolution in a first group of memory locations in said random access memory means;

bulk storage memory for storing video pixel data and for presenting selected blocks of video data at said input port for storage by said random access memory;

size reducing means coupled to said random access memory means for accessing said image video pixel data stored in said random access memory representing said full size image at said first resolution, and for reducing said image to a reduced size counterpart image at a second, lower resolution and for storing said reduced size image at said second resolution in said random access memory in a second group of storage locations therein; and

control means coupled to said random access memory means, said bulk storage means and to said size reducing means for causing said size reducing means to generate said reduced size image at said second resolution and to store same in said random access memory means in said second group of storage locations each time the video pixel data from said random access memory means is to be transferred to said bulk storage means for storage, and for causing the video pixel data from both said first and second plurality of memory locations in said random access memory means to be transferred to said bulk storage means for storage after said reduced size image is generated and

stored in said second group of storage locations, and for causing selective transfer of video pixel data from said bulk storage means into said random access memory means for storage such that either said first resolution image or only the reduced size second resolution counterpart are transferred into said random access memory means.

20. The apparatus of claim 19 wherein said control means also is coupled for causing selective transfer of said second resolution image directly from said size reducing means into said bulk storage means.

21. The apparatus of claim 19 wherein said control means also is coupled for controlling the memory locations in said random access memory means where the video pixel data defining said second resolution image are stored upon transfer from said bulk storage means.

22. The apparatus of claim 21 wherein said size reducing means produces said second resolution image with 1/16th the resolution of said first resolution image and wherein said control means is coupled for causing transfer of said second resolution image into said random access memory for storage at a selected one of 16 predetermined blocks of memory locations.

23. A system for storing and retrieving video data representing video images which are displayed as rasters of vertically distributed horizontal lines, each represented video image normally occupying a raster of selected vertical and horizontal size, the system comprising:

a video image size reducer having an input coupled to receive video data representing a video image

corresponding to a selected raster size and generate therefrom at an output video data representing a reproduction of said video image corresponding to a selected fractional-size of said selected raster size;

a first store having an input for receiving video data for storage and an output for providing video data retrieved from storage, said first store having a capacity for storing video data representing a video image corresponding to of the selected raster size together with video data representing a reproduction of a video image corresponding to the selected fractional-size of said selected raster size;

a second store having an input for receiving video data for storage and an output for providing video data retrieved from storage, said second store having a capacity for storing video data representing a plurality of video images each corresponding to a video frame of the selected raster size and video data representing the reproduction of each video image of selected fractional size of said selected raster size; and

means for selectively transferring from said first store to said second store either said video data representing a video image corresponding to the selected raster size or said video data representing a reproduction of a video image which is the selected fractional size of said selected raster size.

24. A method of storing video pixel data comprising:

receiving data for a full size image at a first resolution and generating therefrom data representing a reduced size reproduction image at a second, lower resolution;

storing both the full size and the reduced size image in a bulk storage medium; and

selectively accessing either the full size or said reduced size image from said bulk storage medium.

25. The method of claim 24 further comprising the steps of storing a plurality of full size images and their reduced size reproduction images and accessing a plurality of selected reduced size images and storing them in selected blocks of storage locations in a random access memory.

26. The method of claim 24 wherein each full size image occupies upon display a raster of selected vertical and horizontal size, and further comprising the steps of storing a plurality of full size images and their reduced size reproduction images and accessing a plurality of selected reduced size images and storing them in a random access memory and outputting the group of stored reduced size reproduction images as a mosaic of reproduction images occupying a raster of the selected vertical and horizontal size.

27. A method of storing video pixel data comprising:

receiving and storing in random access memory video pixel data comprising a full size image;

generating therefrom video pixel data representing a reproduction thereof in the form of a reduced size image at a lower resolution from the full size image data and storing the pixel data representing the reduced size image so generated in additional storage locations in said random access memory along with the full size image;

storing both the full size and the reduced size image in bulk storage memory;

selectively transferring either the full size image or the reduced size image from said bulk storage memory means

into said random access memory means for further processing.

28. A video still store system comprising:

an image store for storing full size image data sets representing a plurality of full size images and for storing a plurality of reduced size image data sets representing a plurality of reduced size images, each of said reduced size image data sets corresponding to one of the full size image data sets;

an external source input for receiving from an external source full size image data sets;

a memory for simultaneous storage of one of said full size image data sets and the corresponding one of said reduced size image data sets;

a size reducer means for receiving from said memory the stored one of said full size image data sets, and for producing and returning to said memory the corresponding reduced size image data set;

said memory being coupled and operative to selectively receive from either the external source input or the image store and to store said one of said full size image data sets, and to output as an output image the stored one of said full size image data sets, and to communicate to the size reducer the stored one of said full size image data sets, and to receive from the size reducer and to store the corresponding reduced size image data set, and to provide to the image store both the stored one of said full size image data sets and the corresponding reduced size image data set, and to receive from the image store and to store at different selected locations selected ones of said plurality of reduced size image data sets, and to output as said output image the stored selected ones such that the selected ones are disposed at different locations

within the output image or to receive and store from said image store only a full sized image data set; and

means to retrieve data from said memory and display it on a raster scanned video display.

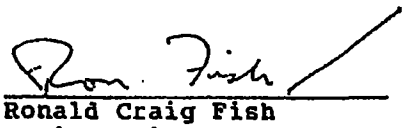
REMARKS

The undersigned thanks the Examiner for the courtesy of the telephone interview. In response to the discussions therein of new claims written by the undersigned, said new claims are submitted herewith for examination based on the substance of the interview. Further, some of the now pending claims have been retained and amended to eliminate the problems under 35 U.S.C. Section 112 noted in the outstanding office action. New claim 28 is the Examiner's suggested rewrite of claim 9 with some minor changes in terminology and one additional element. We would like to add that this claim is a very good claim. We thank the Examiner for taking the time to write it.

New claims 16 through 28 are in accord with the novelty identified by the Examiner in the first Office Action in the parent of the above identified U.S. patent application. Based upon the content of the Hugh Boyd, Quantel reference, which teaches accessing from disk the entire full size picture before size reduction can occur, these new claims are believed to be allowable. This is so because they teach storing a reduced image with the full size image each time a full sized image is to be stored from the frame buffer to the disk. This allows the user the option of retrieving the entire full size image or only the reduced size counterpart from disk. Mosaics of reduced size counterpart images may be made by accessing several reduced size images and moving them around in the frame buffer. The access time for each reduced size image

is only a fraction of the access time for the entire full size image. This system obviously has a major advantage over the Boyd, Quantel system in that access time for a frame comprised of one or more reduced images will be substantially shorter than the Boyd, Quantel system can provide. This is because the Boyd, Quantel reference does not store a reduced image automatically with the full size counterpart each time a full size image in the frame buffer is to be stored on disk. Thus to access any particular reduced image, the entire full size image must be accessed and loaded into the size reducer. Clearly this takes more time than accessing only the data describing the reduced size image from the disk.

Respectfully submitted,
CIOTTI & MURASHIGE

By 
Ronald Craig Fish
Registration No. 28,843

545 Middlefield Road, Suite 200
Menlo Park, California 94025
(415) 327-7250
20 November 1986
0323r

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of

DANIEL BEAULIER

Serial No.: 740,297
Filed: 31 May 1985
For: ELECTRONIC STILL STORE WITH HIGH SPEED SORTING AND METHOD OF OPERATION

Group Art Unit: 262
Examiner: [illegible]

CERTIFICATE OF MAILING BY "EXPRESS MAIL"
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Date of Deposit 20 Dec 1988
I hereby certify that this paper or fee is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 on the date indicated above and is addressed to the Commissioner of Patents and Trademarks, Washington, D.C. 20231.
Kathy E. McKenna
(Typed or Printed Name of Person Mailing Paper or Fee)
Kathy E. McKenna
(Signature of Person Mailing Paper or Fee)

AMENDMENT TRANSMITTAL

Honorable Commissioner of Patents and Trademarks
Washington, D. C. 20231

Sir:

Transmitted herewith is an amendment in the above-identified patent application.

☐ _____ verified statement(s) of small entity status ☐ enclosed ☐ submitted previously.

☒ Petition for Extension of Time enclosed.

☐ No additional fee is required.

☒ An additional fee is required, and has been calculated as shown below:

	No. Claims in Application After This Amendment		Highest No. Claims Previously Paid For		Extra Claims (Not Less Than 0)		Additional Fee
A.	Total Claims 19	minus	20	=	0	x $ 12.00 =	$ 0
B.	Independent Claims 9	minus	3	=	6	x $ 34.00 =	$204.00
C.	If amended to contain multiple dependent claims, add					$110.00 =	$ -
D.	Total Amendment Fee (TOTAL A, B, & C)						$204.00
E.	If small entity, fifty percent reduction of Total Amendment Fee (50% x D)						$ -
F.	Total Additional Fee Due For This Amendment (D minus E)						$204.00

☒ A check in the amount of $594.00 is attached. (includes ext. of time)

☐ Charge $_____ to Deposit Account No. 03-1952.

The Commissioner is hereby authorized to charge any fees under 37 C.F.R. §§1.16 and 1.17 which may be required by this paper, or to credit any overpayment, to Deposit Account No. 03-1952. A duplicate copy of this sheet is enclosed.

CIOTTI & MURASHIGE
545 Middlefield Road
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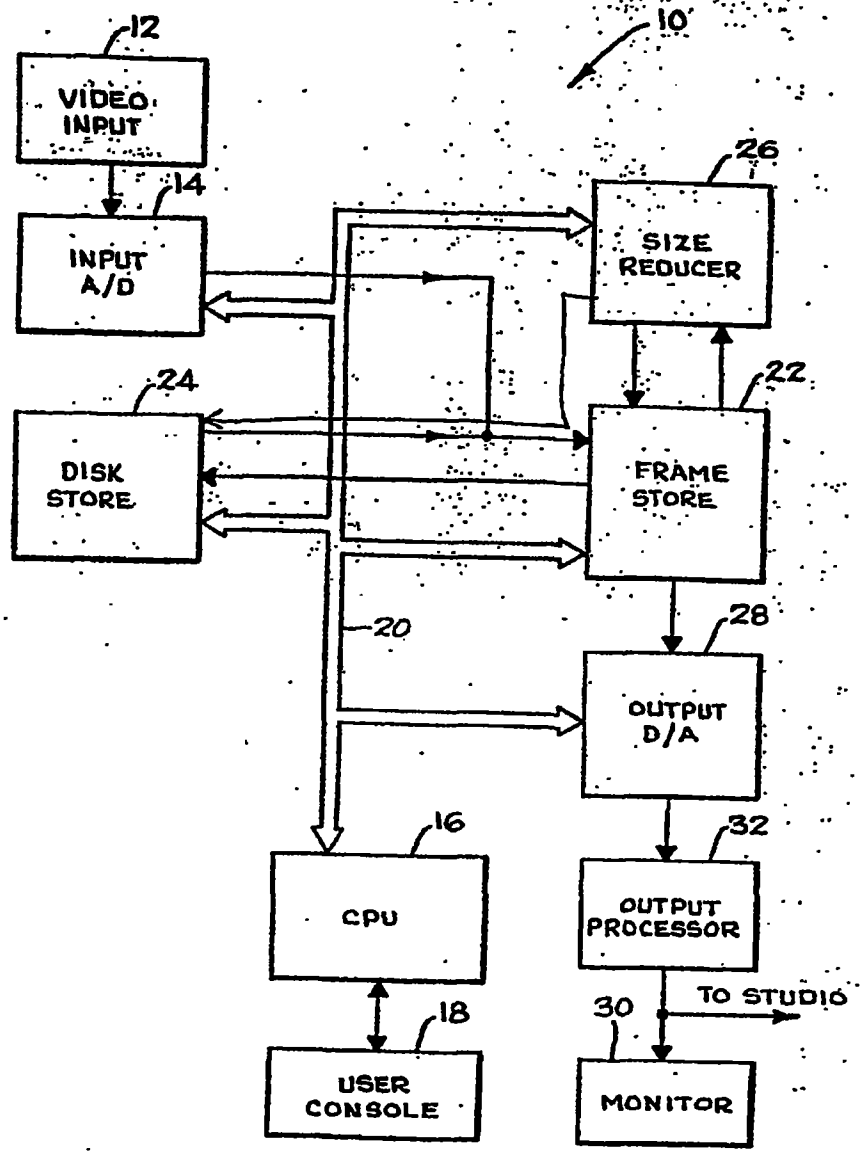
Ron Fish
Ronald C. Fish
Reg. No. 28,843


12
VIDEO INPUT
10
14
INPUT A/D
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SIZE REDUCER
24
DISK STORE
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FRAME STORE
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OUTPUT D/A
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CPU
32
OUTPUT PROCESSOR
TO STUDIO
18
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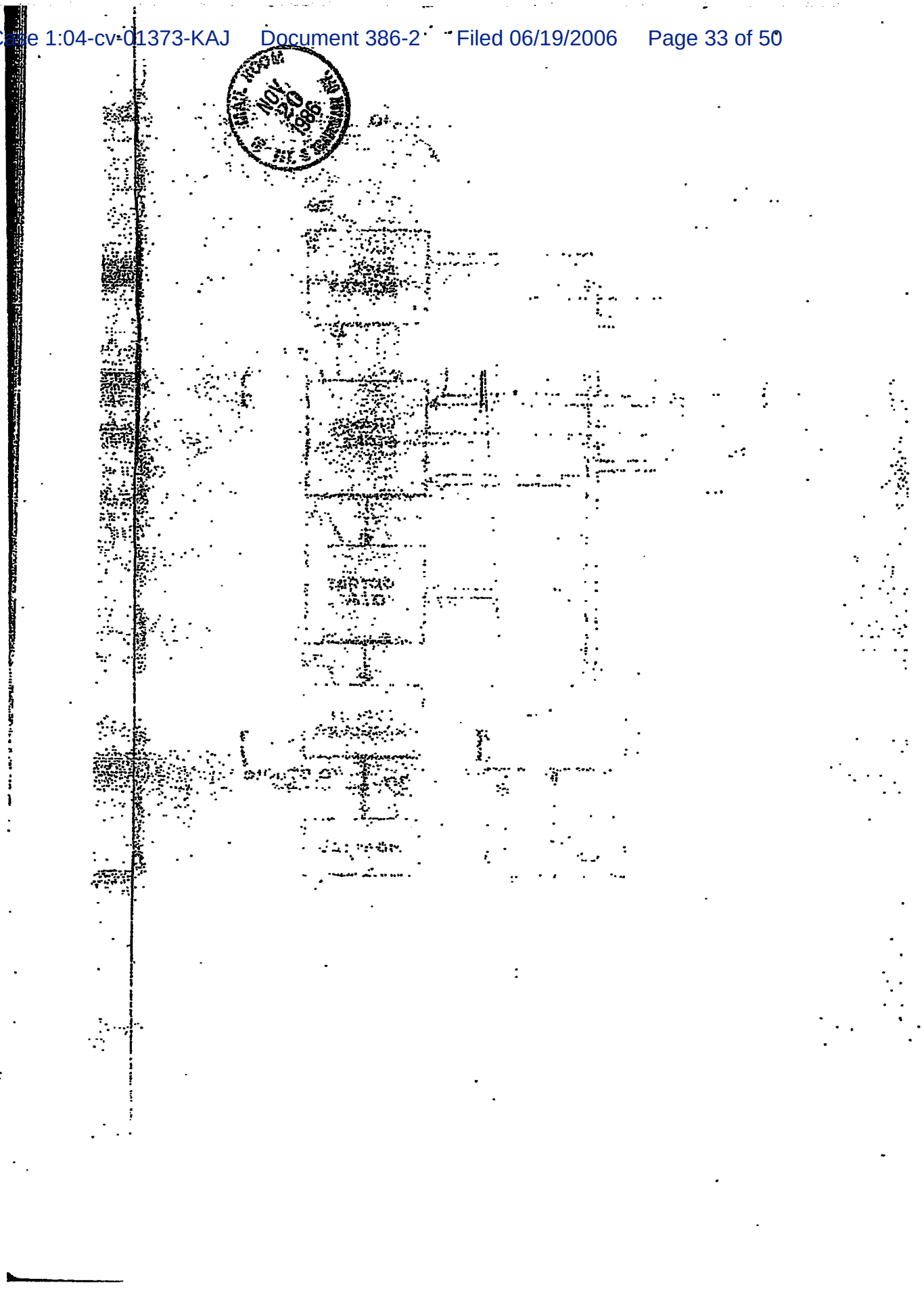
USER CONSOLE
MONITOR



QUANTEL LIMITED

DPB 7000/I

OPERATING AND SERVICE MANUAL

Quantel Limited accepts no responsibility for the accuracy of the information contained herein and reserves the right to change the contents without prior notice.

CHAPTER 4 - DPB 7000/1 SYSTEM OVERVIEW

SECTION 1 INTRODUCTION

1.1 General

The Paintbox system consists of:-

(a) Digitising tablet and controller, with pressure sensitive pen.

(b) Paintbox.

(c) One or more Winchester disc drives.

(d) Floppy disc drive.

(e) Keyboard and Joystick.

The digitising tablet determines the pen position by sending pulses through a grid of magnetoresistive wires and detecting the pulses with a small coil at the tip of the pen. The pen also houses a pressure transducer. The bit pad controller sends position information in a parallel data format to the ID20 interface card which is mounted inside the controller. The interface card scales this data and takes the output of the pressure transducer and digitises it. The card also reads the keyboard and the joystick switches. All this information is serialised and transmitted via an RS422 link to the Paintbox. The system computer in the Paintbox receives it and if required provides a cursor on the Paintbox video output, by sending commands to the Output Timing card, where the cursor is generated.

The Paintbox crate houses all the electronics required for painting, video input and output, and the computer. Figure 1.1 shows a simplified block diagram of the system. The picture seen at the outputs of the machine is stored digitally as Y, R-Y, B-Y components in Framestore 1. The continuous reading of the store at video rate serves to refresh the dynamic memory. Digital data from the store passes through the Combiner card to the Output Processor card where conversion to analogue signals takes place and television syncs added. The Output Timing card generates the picture point clock and all timing signals required for video output. The Output Locking card provides for genlocking of the output to a reference input. Addresses and cycle timing signals for the framestore are generated on the Store Address card. This card also provides for asynchronous reading and writing of the framestore by the system computer. Computer access to the store is controlled by the Brush Address card which also handles the process involved in painting.

Overall control of the system is by a 68000 based computer residing on Computer 1 card and which runs software in PROMs on Computer 2 card. The computer also has its own memory workspace on Computer 2 card. The 68000 receives serial data from the bit pad controller and generates a stream of commands which it sends to the rest of the crate via a computer bus on the backplane. Command destinations are determined by a 4-bit code (called CSR) and data is sent on a 16-bit bus. Most cards only require 12 bits of data for control parameters so the top four bits are often used for further destination decoding.

Pictures are stored by the system on Winchester discs via an SMD Interface. The Disc Sequencer card controls the seek and data transfer operations. The computer has access to directory information on the disc via the Disc Data Buffer which can hold data from a whole track. Picture data can be transferred from disc directly to any of the framestores. The data is deserialised on the Disc Data Buffer card but bypasses the buffer and passes through the Filter card onto the Brush Bus. The Size card determines the addresses at which the disc data will be written into framestore, enabling pictures to be reduced in size and rotated as they are bought off disc. The Size card sends interpolation coefficients to the filter.

The data path from the Brush Bus to the stores is via a bypass route on the Brush Processor cards. Various data routes available through these cards are enabled by function bits held in a status word on the Brush Address card. Direct computer access to the stores for reading and writing is from the Computer Data Bus onto the Brush Store card and from there onto the Brush Bus. The Brush Processor cards handle all computer data to and from the stores onto the Brush Bus as well as arithmetic processing during painting. The operation of painting involves reading the framestore, taking information about the brush from the Brush store and modifying the framestore with it using pressure as a variable. Brush data is loaded when required into the Brush Store from disc. The Brush Address card generates the addressing and refresh for the Brush Store and controls the timing of the painting process.

Both framestores are used during painting but it is only Framestore 1 which is viewed. Store 1 extension may be used as a stencil to inhibit drawing on parts of the picture. The colour palette is held in Store 1 and the menu in Store 2. When pictures are browsed in library mode Store 2 is viewed and the titles are held in Extension 2. Cut outs are held in Store 2 which may be scrolled relative to Store 1. What is seen at the output is determined through computer control of the Combiner card.

When live video is selected the Input Timing card drives the address control bus. Input sync signals from the Input Locking card are used to generate write clocks for the Store Address cards and sample clocks for the ADC card. The live input is digitised on the ADC card and data passes via input timing onto the Brush Bus. The source of input may be either RGB, which is matrixed to Y, R-Y, B-Y before being digitised, or composite video, which is decoded by the Chroma Separator using the two video delay lines.

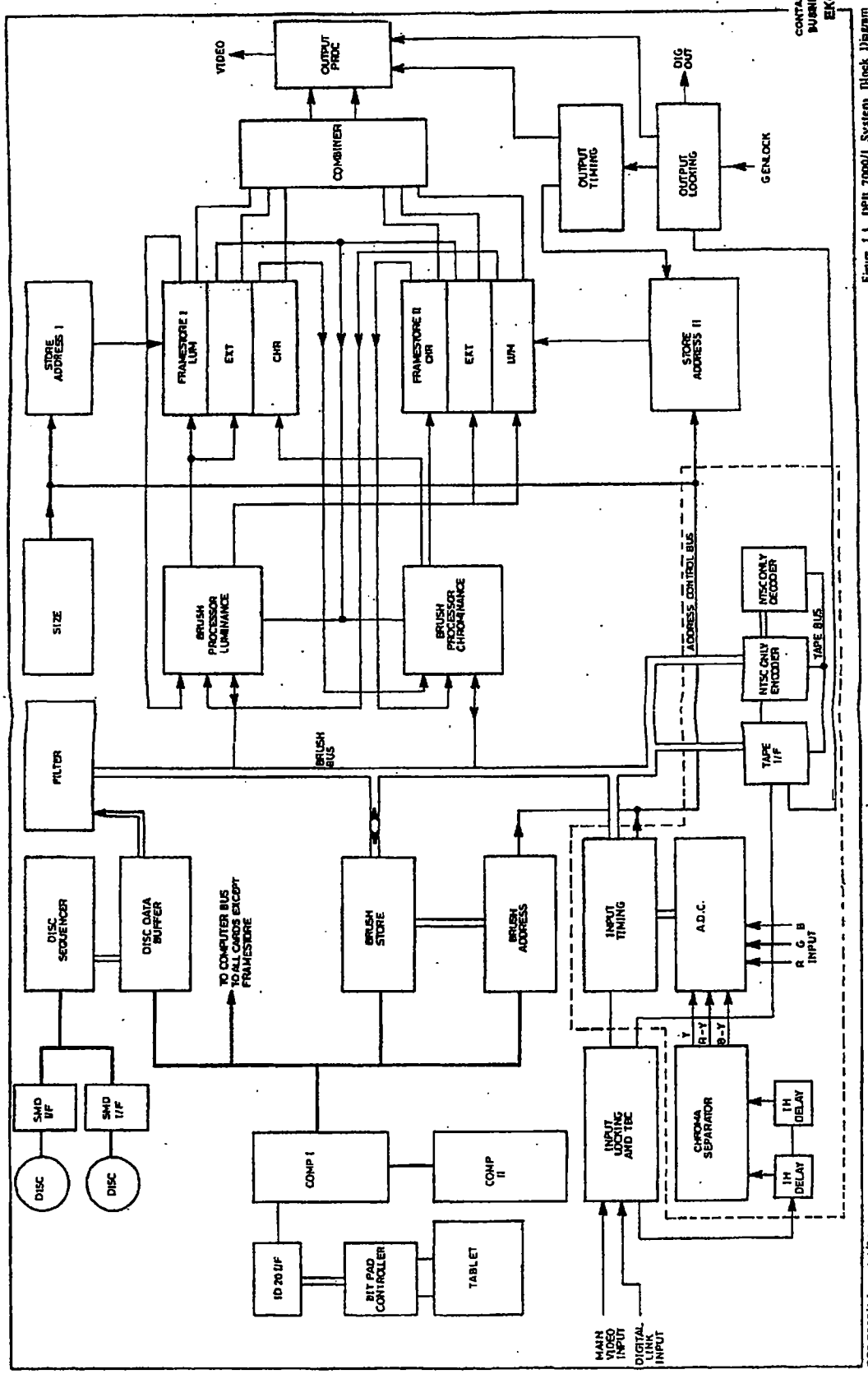
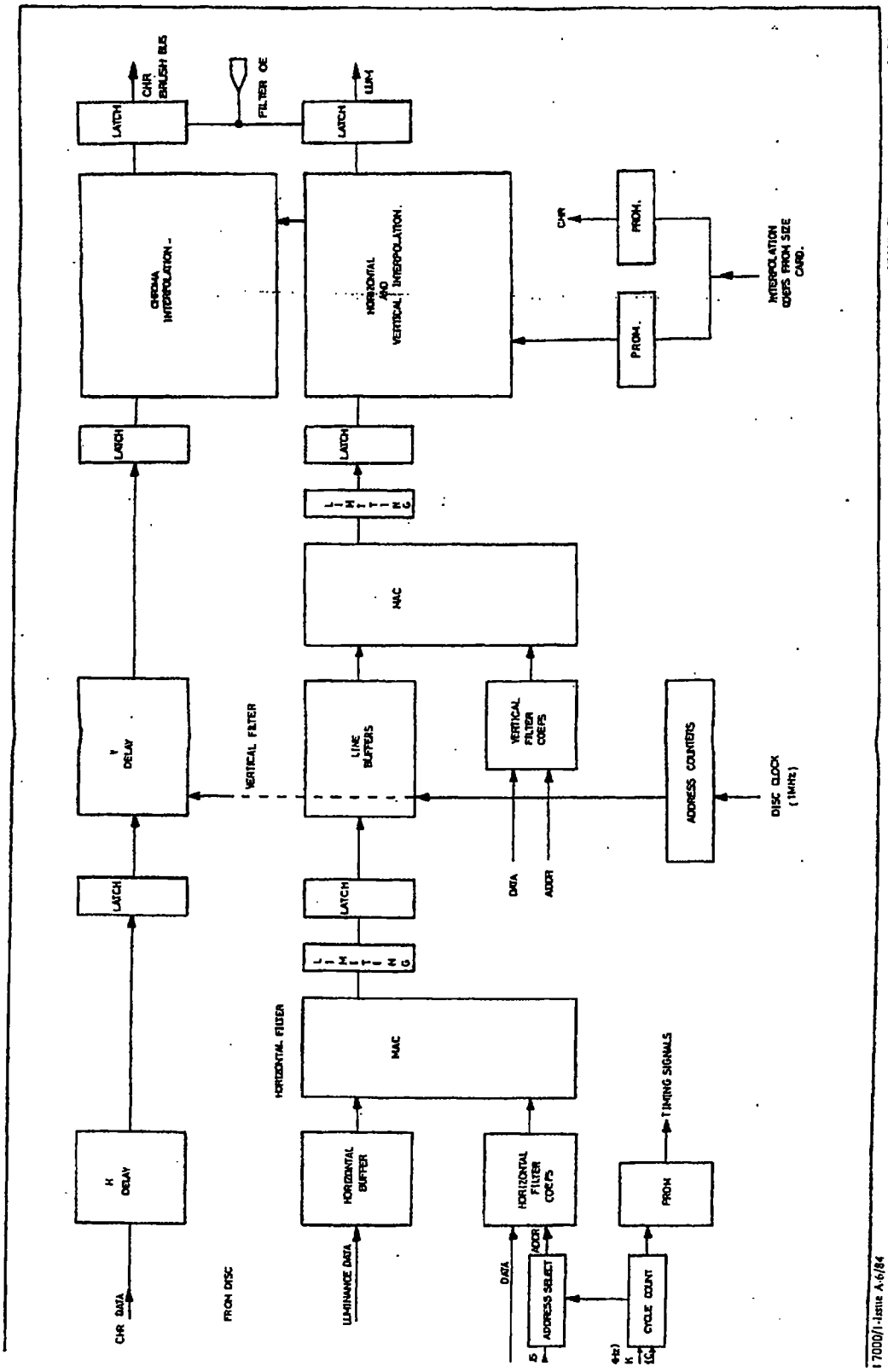


Figure 1.1 DPB 7000/1 System Block Diagram 50/51

DPB 7000/1-Issue A-6/84

SERVICE — MANUAL


CHR BRUSH BUS
FILTER OE
LUM
LATCH
LATCH
CHROMA INTERPOLATION
HORIZONTAL AND VERTICAL INTERPOLATION
CHR
PROM
PROM
INTERPOLATION COEFS FROM SIZE CARD.
LATCH
LATCH
MAC
Y DELAY
VERTICAL FILTER
LINE BUFFERS
VERTICAL FILTER COEFS
ADDRESS COUNTERS
DISC CLOCK (1MHz)
DATA
ADDR
LATCH
LATCH
HORIZONTAL FILTER
MAC
K DELAY
HORIZONTAL BUFFER
HORIZONTAL FILTER COEFS
PROM
TIMING SIGNALS
CHR DATA
FROM DISC
LUMINANCE DATA
DATA
ADDR
ADDRESS SELECT
CYCLE COUNT
17000/1-Issue A-6/84
17427, Figure 1 Filter Card Block Diagram
CONTAINS CONFIDENTIAL BUSINESS INFORMATION
EKC 00300174


Quantel
Paintbox Demonstration
10th March 2005
CONTAINS CONFIDENTIAL
BUSINESS INFORMATION
EKC 002001284

REDACTED

UNITED STATES INTERNATIONAL TRADE COMMISSION
WASHINGTON, D.C.

Before the Honorable Robert L. Barton, Jr.
Administrative Law Judge

In the Matter of	
CERTAIN DIGITAL IMAGE STORAGE AND RETRIEVAL DEVICES	**Investigation No. 337-TA-527**

DIRECT EXPERT TESTIMONY OF RICHARD TAYLOR

RX 104C – 1-92

REDACTED

RX-042 offered into evidence.

Q. Please turn to RX-043. Do you recognize this document?

A. Yes. This is the Paint Box Operating and Service Manual.

Q. Who created this manual?

A. We created it at Quantel.

Q. It is dated 1984. What connection does it have with the system that was sold to the Weather Channel?

A. For the purposes of my analysis, it describes the functionality that was present in the Weather Channel system.

Q. How do you know?

A. Again, I designed and built the system and I contributed to the manuals. The Service Manual describes in detail the functionality referenced in the product release documents that we have discussed.

RX-043 offered into evidence.

REDACTED

CONTAINS CONFIDENTIAL BUSINESS INFORMATION

I state under penalty of perjury that the foregoing is true and correct. Executed this 15th day of July, 2005.

Richard J. Taylor

VOLUME: I

PAGES: 1-115

EXHIBITS: 1-7

IN THE UNITED STATES DISTRICT COURT

FOR THE DISTRICT OF DELAWARE

- x

AMPEX CORPORATION,

Plaintiff,

v. Civil Action

EASTMAN KODAK COMPANY, ALTEK CORPORATION and CHINON INDUSTRIES, INC., No. 04-1373-KAJ

Defendants.

- x

DEPOSITION of MARTIN A. HOLBROOK

March 10, 2006

9:44 a.m.

Ropes & Gray LLP

One International Place

Boston, Massachusetts

Reporter: Michael D. O'Connor, RPR

1982. The Paint Box was demonstrated in the United States by Martin Holbrook at the 1982 NAB conference from April 4 to 7, 1982." Is that a reference to you?

A. It is.

Q. Did you, in fact, demonstrate the Paint Box at the NAB 1982?

A. Yes, I did.

Q. At that point did the Paint Box have a cut and paste function?

A. Yes, it did.

Q. What do you recall about when that feature was first added to the Paint Box?

A. It became clear during the previous year, in the Las Vegas NAB, that this was an integral function of a future graphic system, so the development continued on that in the latter half of 1981.

Q. Could you explain how it became clear that that was a feature that should be added, that being cut and paste?

A. Visitors to the NAB suite in 1981 who had looked at the Paint Box, designers, in other words, television graphic designers, and myself, made quite

at that demonstration?

A. I can't recall that.

Q. Do you know someone named Daniel Beaulier?

A. I have not heard of this name.

Q. So I take it you would not recognize Dan Beaulier from Ampex?

A. I would certainly not.

Q. What can you recall about what was demonstrated about the Paint Box?

MR. SUMMERSGILL: And you're talking, again, about NAB '82?

MR. BEAMER: NAB '82, yes.

A. When you say "what was demonstrated," are we talking functions of the machine or the manner in which it was demonstrated?

Q. I'm interested in anything you can recall about that demonstration. So both of the things you mentioned would be of interest.

A. What we were demonstrating was a full-production model of the Paint Box, which was up and running by, I would say, January of 1982.

Q. Did you put it through its paces, so to speak?

A. I put it through its paces on the hour,

demonstrate. I sat down and devised something. Richard Taylor and the team approved it, and that's what we did.

Q. But there was no written memoranda or list?

A. No script, no.

Q. Not even an outline of what was going to be done?

A. Somebody may have written one, but I never saw it.

Q. Let me go back to your employment history, if you will. How long were you at Quantel?

A. I left the company eventually, I suppose, in 1987, something like that.

Q. Were you art director throughout your tenure at Quantel?

A. Yes.

Q. Were you responsible for other products besides Paint Box?

A. Yes.

Q. What other products did you work on?

A. I had input into a number of Paint Box derivative products, including a character generator, an affects machine, and subsequently a Paint Box designed for the print industry.

Q. My question is whether the particular four paragraphs I've asked you to focus on, is that a description of a demo that you actually performed as part of your demonstration at the NAB '82?

A. I don't recollect that particular imagery, no.

Q. Do you recollect any imagery from that demonstration, in the context of cut and paste?

MR. SUMMERSGILL: Objection.

A. I recollect a simple exercise that I did for the hourly demonstration.

Q. What was that? Could you describe that?

A. It was a, as I say, a very simple demonstration, using some of the same facilities as mentioned in these paragraphs, but necessarily short for stage presentation.

What I did was create a mask or stencil, which is actually in the first or second paragraphs of "The Paint Box, a Perfect Picture Assembly Aid, Cut and Paste, Page 4, cutting a circular hole in a stencil medium, obviously electronically, the equivalent, as I say, cutting in a plastic film. I used an air brush facility within the Paint Box to create what looked like a ball bearing, a

three-dimensional circle.

I was able, then, to cut out and move, as described in this document, this ball bearing. I could paste the ball bearing onto the background at any size, and stick it in position. I then had another ball bearing on the end of my pen, which I could reduce in size, in this case with the aid of the joystick probably, and by reactivating the mask or stencil, I could actually manipulate the small ball bearing in the matter of a moon around, in front of and behind, the large ball bearing. Either of those images I could have stored.

That was the sort of thing one could do for a short demonstration. Obviously when talking individually to a professional designer, one would be more detailed.

Q. What do you mean by either of those images could then be stored?

A. I should explain, and I'm sorry. I will refer to this ball bearing, simply because it's a useful example. By sticking the large ball bearing onto the background, that actually becomes a full frame image, a picture as I would call it. The little moon ball bearing I was manipulating is a

cutout or a reduced-sized image.

Q. So the reduced-sized ball bearing was generated from cutting out the full-sized ball bearing; is that what you're saying?

A. Yes.

Q. And you would use the joystick to reduce it in size?

A. I would probably have used the joystick. You could also have used the -- one could also have used the keyboard if you preferred.

Q. Then how do you move it? You were talking about it orbiting, in effect, the larger ball bearing. How would you do that?

A. When you have removed an image from -- when you've cut out an image -- I will refer to it as a cutout, and you can also call it a reduced-sized image or whatever, but I will call it a cutout, because I've cut it out -- it remains, like on the end of a pen, attached to the end of a pen, so if you remove the pen, the small ball bearing will occupy the equivalent position in space.

Q. So the movement is caused by your moving the pen --

A. Yes.

Q. -- then the image would move accordingly; is that right?

A. Yes.

Q. Now, I think you've referred to the capability of the Paint Box at the NAB '82 to save cutouts. How would you do that?

A. I don't know whether I did mention it, but, yes, you can save cutouts.

Q. Would you would you save cutouts?

A. In the same way that you would save, say, a full-sized picture.

Q. If you cut out the ball bearing that you had drawn, and reduced it in the manner that you spoke of earlier, and now you're moving it around showing how it could be moved around, at that point if you invoke the save cutout function, what is saved?

MR. SUMMERSGILL: Objection. Hypothetical. You can answer.

A. When you cut something out, it remains the size it is cut out, until you design to alter it. So if I were to save cutout at that point, it would have been saved its original size. If I wanted to reduce it and save it at the reduced size, it would

be a slightly extended procedure.

Q. So just to make the record clear, if you simply invoked -- even after you had reduced it in size and you were moving it around, if at that point you said save cutout, it would save it at its original size?

MR. SUMMERSGILL: Objection. Hypothetical.

A. Correct. Well, that is a hypothetical question, but you're correct, in essence, yes.

Q. So you said there was a more extended procedure for saving the actual reduced-sized ball bearing as an individual cutout. How would you do that?

A. The procedure I would adopt would be to take your reduced-sized ball bearing that we are manipulating, and fix it and stick it in position on the frame, and then recut it at that size. Then you would refer to the library menus and store it in the library, which it is then stored at its reduced size.

Q. When you stick the reduced-sized ball bearing, as you just said, then it becomes part of the full-frame picture, right?

MR. SUMMERSGILL: Objection. Vague,